

**What is claimed is:**

1. A packet transfer path control apparatus which controls a transfer of a unicast packet and a  
5 multicast packet, comprising:

an output port determination unit determining an output port through which a packet input from any of one or more input ports is to be output, and assigning output order identification information  
10 for designation of an output order of the packet;

a packet data storage unit storing data of the input packet; and

a plurality of packet output units respectively corresponding to the plurality of  
15 output ports, each packet output unit reading data of a packet determined by said output port determination unit to be output through a corresponding output port associated with the packet output unit in an output order indicated by  
20 the output order identification information from said packet data storage unit, and outputting the read data through the corresponding output port.

2. The apparatus according to claim 1, further  
25 comprising:

a unicast packet management information storage unit storing for each output port management information including a storage position in said packet data storage unit of the data of each unicast packet to be output through the output port and output order identification information for the unicast packet; and

a multicast packet management information storage unit provided for each output port and storing, for each of the multicast packets to be output through the output port, management information including a storage position in said packet data storage unit of the data of the multicast packet and output order identification information of the multicast packet.

3. The apparatus according to claim 2, wherein said packet output unit for each output port compares output order identification information about a next output unicast candidate of packets whose packet management information is stored in said unicast packet management information storage unit with output order identification information about a next output multicast candidate of packets whose packet management information is stored in

said multicast packet management information storage unit, and determining a packet to be output next from the output port.

- 5        4.        The apparatus according to claim 1, wherein  
              said output order identification information  
              is serial numbers indicating input orders of all  
              packets input through all input ports, or a serial  
              number for all packets input through each output.

10

5.        A packet transfer path control apparatus  
              which controls a transfer of a unicast packet and a  
              multicast packet, comprising:

              an output port determination unit determining  
15        an output port through which a packet input from  
              any of one or more input ports is to be output;

              a pointer storage unit storing for each  
              output port a pointer to a location where there is  
              stored data of a last input one of the unicast  
20        packets to be output through the output port or  
              packet management data for the last input unicast  
              packet;

              a packet data storage unit storing data of  
              each input packet;

25        a packet output unit provided for each output

port, reading data of a packet determined by said output port determination unit to be output through the output port in an output order for guarantee of an input/output order of a unicast packet and a  
5 multicast packet based on stored contents of said pointer storage unit from said packet data storage unit, and outputting the read data through the output port.

10 6. The apparatus according to claim 5, further comprising:

a unicast packet management information storage unit storing for each output port packet management information including a storage position  
15 in said packet data storage unit for data of each unicast packet to be output through the output port; and

a multicast packet management information storage unit provided for each output port and  
20 storing packet management information including a storage position in said packet data storage unit for data of each multicast packet to be output through the output port, and a value of a pointer read corresponding to the output port from said  
25 pointer storage unit when the multicast packet is

input.

7. The apparatus according to claim 6, wherein  
said pointer points to a storage position in  
5 said packet data storage unit for data of a last  
input unicast packet, or a storage position of  
packet management information corresponding to the  
unicast packet in said unicast packet management  
information storage unit.

10

8. The apparatus according to claim 7, wherein  
said packet output unit for each output port  
storing a storage position in said unicast packet  
management information storage unit of packet  
15 management information for a unicast packet output  
immediately before from the output port, comparing,  
when a next packet is to be output through the  
output port, a value of the pointer to a next  
output candidate of multicast packets whose packet  
20 management information is stored in said multicast  
packet management information storage unit with the  
storage position, and outputting a multicast packet  
when the value match the storage position or  
outputting a unicast packet when the value does not  
25 match the storage position.

9. A program used to direct a computer to control a transfer of a unicast packet and a multicast packet, comprising:

5 a procedure of determining one of output ports through which one a packet input through an input port is to be output;

a procedure of, if the input packet is a unicast packet to be output through the one output port, writing, for the one output port, order  
10 identification information assigned for the unicast packet in a table storing for each output port the management information about each unicast packet to be output thorough the output port, the order  
15 identification information being assigned to all packets to be output through all of the output ports or all packets to be output through each port in to input order; and

a procedure of, if the input packet is a  
20 multicast packet to be output through the one output port, writing order identification information assigned for the multicast packet in a table provided for the one output port and storing the management information about each multicast  
25 packet to be output through the one output port,

the order identification information being assigned to all packets to be output through all of the output ports or all packets to be output through each port in to input order.

5

10. The program according to claim 9, further comprising:

10 a procedure of reading order identification information about a unicast packet to be output next from a table storing unicast packet management information corresponding to an output port, and reading order identification information about a multicast packet to be output next from a table storing multicast packet management information;

15 and

a procedure of comparing the two read values of order identification information, and determining which packet is to be output next through the output port, a unicast packet or a

20 multicast packet.

11. A program used to direct a computer to control a transfer of a unicast packet and a multicast packet, comprising:

25 a procedure of determining one of output

ports through which one a packet input through an input port is to be output;

a procedure of, when the input packet is a unicast packet, storing for the one output port a storage address in a table storing management information about the input packet or a storage address in a table storing the data of the input packet; and

a procedure of, when the packet is a multicast packet, writing in a table storing management information about a multicast packet for each output port through which the packet is to be output a storage address in a table storing management information about a unicast packet stored corresponding to the output port or a storage address in a table storing the data of the packet.

12. The program according to claim 11, further comprising:

a procedure of reading a storage address in a table storing management information about the unicast packet corresponding to a multicast packet to be next output, or a storage address in a table storing data of a unicast packet from a table



storing management information about a multicast packet for each output port;

5 a procedure of comparing the read storage address in a table storing management information about the unicast packet or a storage address in a table storing data of the unicast packet with a storage address in a table storing management information about the last output unicast packet or the storage address in a table storing the data of  
10 the packet, and determining which is to be output from the output port, a unicast packet or a multicast packet; and

a procedure of, when a unicast packet is output, storing a storage address in a table  
15 storing management information about the unicast packet to be output or a storage address in a table storing data of the packet.

13. A packet transfer path control apparatus  
20 which controls a transfer of a unicast packet and a multicast packet, comprising:

output port determination means for  
determining an output port through which a packet  
input from any of one or more input ports is to be  
25 output, and assigning output order identification

information for designation of an output order of the packet;

packet data storage means for storing data of the input packet; and

5 packet output means provided for each of a plurality of output ports for reading data of a packet determined by said output port determination unit to be output through the output port in an output order indicated by the output order  
10 identification information from said packet data storage means, and outputting the read data through the output port.

14. A packet transfer path control apparatus  
15 which controls a transfer of a unicast packet and a multicast packet, comprising:

output port determination means for  
determining an output port through which a packet  
input from any of one or more input ports is to be  
20 output;

pointer storage means for storing for each  
output port a pointer to a last input one of  
unicast packets to be output through the output  
port, or packet management information about the  
25 last input unicast packet;

packet data storage means for storing data of each input packet;

5 a plurality of packet output means provided for a plurality of output ports for reading data of a packet determined by said output port  
determination means to be output through the output port in an output order for guarantee of an input/output order of a unicast packet and a  
multicast packet based on stored contents of said  
10 pointer storage means from said packet data storage means, and outputting the read data through the output port.